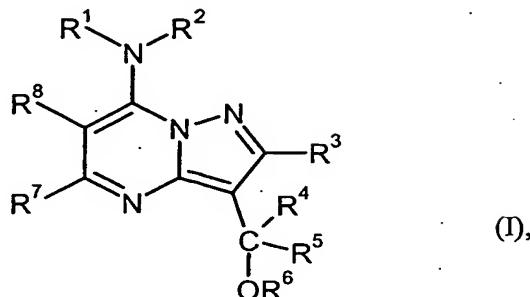


Claims

1. A pyrazolopyrimidine of the formula



in which

5 R¹ represents optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted cycloalkyl or optionally substituted heterocyclyl,

R² represents hydrogen or alkyl, or

10 R¹ and R² together with nitrogen atom to which they are attached represent an optionally substituted heterocyclic ring,

R³ represents hydrogen, halogen, optionally substituted alkyl or optionally substituted cycloalkyl,

15 R⁴ represents hydrogen, optionally substituted alkyl, optionally substituted cycloalkyl, optionally substituted alkoxyalkyl, optionally substituted alkenyl, optionally substituted alkynyl or optionally substituted benzyl,

R⁵ represents hydrogen, optionally substituted alkyl, optionally substituted cycloalkyl, optionally substituted alkoxyalkyl, optionally substituted alkenyl, optionally substituted alkynyl or optionally substituted benzyl,

20 R⁶ represents hydrogen, optionally substituted alkyl, optionally substituted cycloalkyl, optionally substituted alkoxyalkyl, optionally substituted alkenyl, optionally substituted alkynyl or optionally substituted benzyl, or

R⁵ and -OR⁶ together represent a radical of the formula $-\text{O}-(\text{CH}_2)_p-\text{O}-$ in which

p represents integers from 1 to 5 and

1 to 3 hydrogen atoms may be replaced by methyl, ethyl, hydroxy, methoxy, ethoxy, hydroxymethyl, methoxymethyl or ethoxymethyl,

5 R⁷ represents halogen, CN, optionally substituted alkoxy, optionally substituted alkylthio, optionally substituted alkylsulfinyl, optionally substituted alkylsulfonyl or optionally substituted alkyl and

R⁸ represents optionally substituted aryl.

2. The pyrazolopyrimidine of the formula (I) as claimed in claim 1, where

10 R¹ represents alkyl having 1 to 6 carbon atoms which may be mono- to pentasubstituted by identical or different substituents from the group consisting of halogen, cyano, hydroxy, alkoxy having 1 to 4 carbon atoms and cycloalkyl having 3 to 6 carbon atoms, or

15 R¹ represents alkenyl having 2 to 6 carbon atoms which may be mono- to trisubstituted by identical or different substituents from the group consisting of halogen, cyano, hydroxy, alkoxy having 1 to 4 carbon atoms and cycloalkyl having 3 to 6 carbon atoms, or

R¹ represents alkynyl having 3 to 6 carbon atoms which may be mono- to trisubstituted by identical or different substituents from the group consisting of halogen, cyano, alkoxy having 1 to 4 carbon atoms and cycloalkyl having 3 to 6 carbon atoms, or

20 R¹ represents cycloalkyl having 3 to 6 carbon atoms which may be mono- to trisubstituted by identical or different substituents from the group consisting of halogen and alkyl having 1 to 4 carbon atoms, or

25 R¹ represents saturated or unsaturated heterocyclyl having 5 or 6 ring members and 1 to 3 heteroatoms, such as nitrogen, oxygen and/or sulfur, where the heterocyclyl may be mono- or disubstituted by halogen, alkyl having 1 to 4 carbon atoms, cyano, nitro and/or cycloalkyl having 3 to 6 carbon atoms,

R² represents hydrogen or alkyl having 1 to 4 carbon atoms, or

30 R¹ and R² together with the nitrogen atom to which they are attached represent a saturated or unsaturated heterocyclic ring having 3 to 6 ring members, where the heterocycle may contain a further nitrogen, oxygen or sulfur atom as ring member and where

the heterocycle may be substituted up to three times by fluorine, chlorine, bromine, alkyl having 1 to 4 carbon atoms and/or haloalkyl having 1 to 4 carbon atoms and 1 to 9 fluorine and/or chlorine atoms,

5 R³ represents hydrogen, fluorine, chlorine, bromine, iodine, alkyl having 1 to 4 carbon atoms, haloalkyl having 1 to 4 carbon atoms and 1 to 9 halogen atoms or represents cycloalkyl having 3 to 6 carbon atoms,

10 R⁴ represents hydrogen, alkyl having 1 to 4 carbon atoms, haloalkyl having 1 to 4 carbon atoms in the alkyl moiety, cycloalkyl having 3 to 6 carbon atoms, alkoxyalkyl having 1 or 2 carbon atoms in the alkoxy moiety and 1 to 4 carbon atoms in the alkyl moiety, alkenyl having 2 to 5 carbon atoms, alkynyl having 2 to 5 carbon atoms or benzyl,

15 R⁵ represents hydrogen, alkyl having 1 to 4 carbon atoms, haloalkyl having 1 to 4 carbon atoms in the alkyl moiety, cycloalkyl having 3 to 6 carbon atoms, alkoxyalkyl having 1 or 2 carbon atoms in the alkoxy moiety and 1 to 4 carbon atoms in the alkyl moiety, alkenyl having 2 to 5 carbon atoms, alkynyl having 2 to 5 carbon atoms or benzyl,

20 R⁶ represents hydrogen, alkyl having 1 to 4 carbon atoms, alkoxyalkyl having 1 to 2 carbon atoms in the alkoxy moiety and 1 to 4 carbon atoms in the alkyl moiety, alkenyl having 2 to 5 carbon atoms, alkynyl having 2 to 5 carbon atoms or benzyl, or

R⁵ and -OR⁶ together represent a radical of the formula —O—(CH₂)_p—O—

in which

p represents 2, 3 or 4 and

25 1 or 2 hydrogen atoms may be replaced by methyl, ethyl, hydroxy, methoxy, ethoxy, hydroxymethyl, methoxymethyl or ethoxymethyl,

R⁷ represents fluorine, chlorine, bromine, CN, methyl, alkoxy having 1 to 4 carbon atoms, alkylthio having 1 to 4 carbon atoms, alkylsulfinyl having 1 to 4 carbon atoms or alkylsulfonyl having 1 to 4 carbon atoms, and

R⁸ represents phenyl which may be mono- to tetrasubstituted by identical or different substituents from the group consisting of halogen, cyclo, nitro, amino, hydroxy, formyl, carboxy, carbamoyl, thiocarbamoyl;

5 in each case straight-chain or branched alkyl, alkoxy, alkylthio, alkylsulfinyl or alkylsulfonyl having in each case 1 to 6 carbon atoms;

in each case straight-chain or branched alkenyl or alkenyl having in each case 2 to 6 carbon atoms;

10 in each case straight-chain or branched haloalkyl, haloalkoxy, haloalkylthio, haloalkylsulfinyl or haloalkylsulfonyl having in each case 1 to 6 carbon atoms and 1 to 13 identical or different halogen atoms;

in each case straight-chain or branched haloalkenyl or haloalkenyloxy having in each case 2 to 6 carbon atoms and 1 to 11 identical or different halogen atoms;

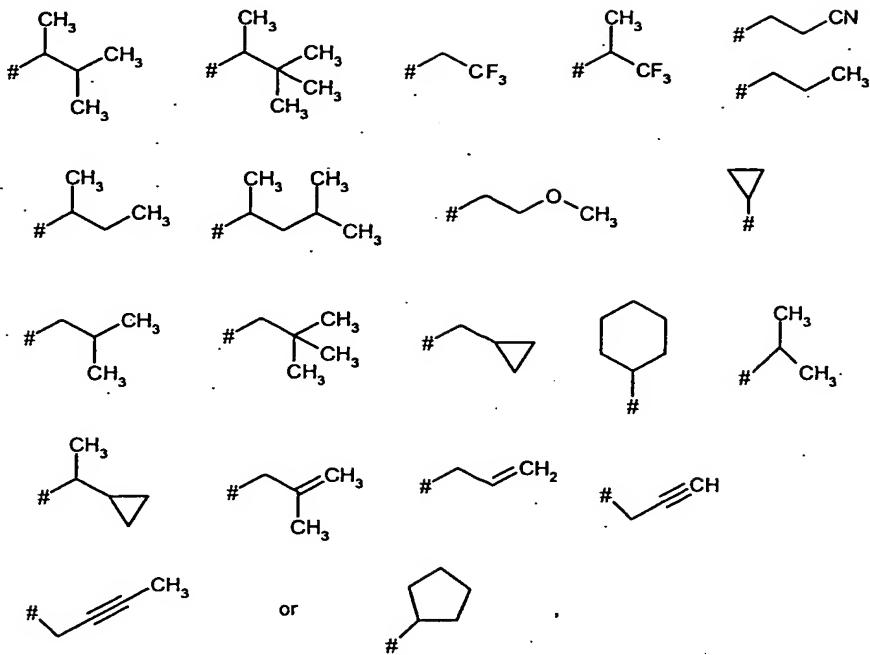
15 in each case straight-chain or branched alkylamino, dialkylamino, alkylcarbonyl, alkylcarbonyloxy, alkoxycarbonyl, alkylsulfonyloxy, hydroximinoalkyl or alkoximinoalkyl having in each case 1 to 6 carbon atoms in the individual alkyl moieties;

cycloalkyl having 3 to 6 carbon atoms,

20 2,3-attached 1,3-propanediyl, 1,4-butanediyl, methylenedioxy (-O-CH₂-O-) or 1,2-ethylenedioxy (-O-CH₂-CH₂-O-), where these radicals may be mono- to polysubstituted by identical or different substituents from the group consisting of halogen, alkyl having 1 to 4 carbon atoms and haloalkyl having 1 to 4 carbon atoms and 1 to 9 identical or different halogen atoms.

3. The pyrazolopyrimidine of the formula (I) as claimed in claim 1 or 2, where

R¹ represents a radical of the formula



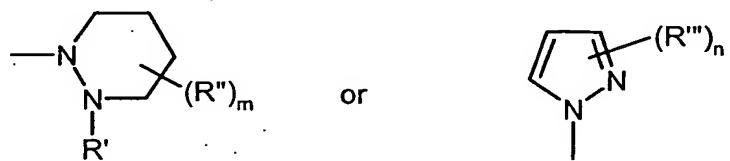
where # denotes the point of attachment and where in the case of radicals which may be present in optically active form each of the possible stereoisomers or else mixtures thereof may be present,

5 R² represents hydrogen, methyl, ethyl or propyl, or

R¹ and R² together with the nitrogen atom to which they are attached represent pyrrolidinyl, piperidinyl, morpholinyl, thiomorpholinyl, piperazinyl, 3,6-dihydro-1(2H)-piperidinyl or tetrahydro-1(2H)-pyridazinyl, where these radicals may be substituted by 1 to 3 fluorine atoms, 1 to 3 methyl groups and/or trifluoromethyl,

10 or

R¹ and R² together with the nitrogen atom to which they are attached represent a radical of the formula



in which

15 R' represents hydrogen or methyl,

R" represents methyl, ethyl, fluorine, chlorine or trifluoromethyl,

m represents the number 0, 1, 2 or 3, where R" represents identical or different radicals if m represents 2 or 3,

R''' represents methyl, ethyl, fluorine, chlorine or trifluoromethyl

5 and

n represents the number 0, 1, 2 or 3, where R''' represents identical or different radicals if n represents 2 or 3,

10 R³ represents hydrogen, fluorine, chlorine, bromine, iodine, methyl, ethyl, isopropyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, trifluoromethyl, 1-trifluoromethyl-2,2,2-trifluoroethyl or heptafluoroisopropyl,

R⁴ represents hydrogen, methyl, ethyl, propyl, methoxymethyl, methoxyethyl, alkenyl having 3 or 4 carbon atoms, alkynyl having 3 or 4 carbon atoms or benzyl,

R⁵ represents hydrogen, methyl, ethyl, propyl, methoxymethyl, methoxyethyl, alkenyl having 3 or 4 carbon atoms, alkynyl having 3 or 4 carbon atoms or benzyl,

15 R⁶ represents hydrogen, methyl, ethyl, propyl, methoxymethyl, methoxyethyl, alkenyl having 3 or 4 carbon atoms, alkynyl having 3 or 4 carbon atoms or benzyl, or

R⁵ and -OR⁶ together represent a radical of the formula $\text{---O---CH}_2\text{---CH}_2\text{---O---}$ in which 1 or 2 hydrogen atoms may be replaced by methyl, ethyl, hydroxy, methoxy, ethoxy, hydroxymethyl, methoxymethyl or ethoxymethyl,

20 R⁷ represents fluorine, chlorine, bromine, methoxy, ethoxy, methylthio, methylsulfinyl or methylsulfonyl, and

R⁸ represents phenyl which may be mono- to trisubstituted by identical or different substituents from the group consisting of

25 fluorine, chlorine, bromine, cyano, nitro, formyl, methyl, ethyl, n- or i-propyl, n-, i-, s- or t-butyl, allyl, propargyl, methoxy, ethoxy, n- or i-propoxy, methylthio, ethylthio, n- or i-propylthio, methylsulfinyl, ethylsulfinyl, methylsulfonyl, ethylsulfonyl, allyloxy, propargyloxy, trifluoromethyl, trifluoroethyl, difluoromethoxy, trifluoromethoxy, difluorochloromethoxy, trifluoroethoxy, difluoromethylthio,

5 difluorochloromethylthio, trifluoromethylthio, trifluoromethylsulfinyl, trifluoromethylsulfonyl, trichloroethynloxy, trifluoroethynloxy, chloroallyloxy, iodopropargyloxy, methylamino, ethylamino, n- or i-propylamino, dimethylamino, diethylamino, acetyl, propionyl, acetyloxy, methoxycarbonyl, ethoxycarbonyl, hydroximinomethyl, hydroximinoethyl, methoximinomethyl, ethoximinomethyl, methoximinoethyl, ethoximinoethyl, cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl,

10 2,3-attached 1,3-propanediyl, methylenedioxy (-O-CH₂-O-) or 1,2-ethylenedioxy (O-CH₂-CH₂-O), where these radicals may be mono- or polysubstituted by identical or different substituents from the group consisting of fluorine, chlorine, methyl, ethyl, n-propyl, i-propyl and trifluoromethyl.

4. The pyrazolopyrimidine of the formula (I) as claimed in one or more of claims 1 to 3, where

R⁷ represents fluorine, chlorine, bromine, CN, methyl, methoxy or methylthio and

15 R⁸ represents 2,4-, 2,5- or 2,6-disubstituted phenyl or 2-substituted phenyl or represents 2,4,6-trisubstituted phenyl, where the substituents are selected from the group consisting of

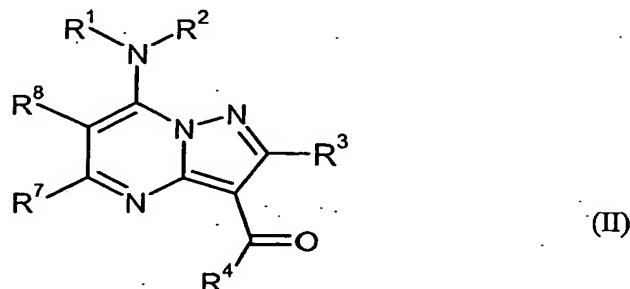
20 fluorine, chlorine, bromine, cyano, nitro, formyl, methyl, ethyl, n- or i-propyl, n-, i-, s- or t-butyl, allyl, propargyl, methoxy, ethoxy, n- or i-propoxy, methylthio, ethylthio, n- or i-propylthio, methylsulfinyl, ethylsulfinyl, methylsulfonyl, ethylsulfonyl, allyloxy, propargyloxy, trifluoromethyl, trifluoroethyl, difluoromethoxy, trifluoromethoxy, difluorochloromethoxy, trifluoroethoxy, difluoromethylthio, difluorochloromethylthio, trifluoromethylthio, trifluoromethylsulfinyl, trifluoromethylsulfonyl, trichloroethynloxy, trifluoroethynloxy, chloroallyloxy, iodopropargyloxy, methylamino, ethylamino, n- or i-propylamino, dimethylamino, diethylamino, acetyl, propionyl, acetyloxy, methoxycarbonyl, ethoxycarbonyl, hydroximinomethyl, hydroximinoethyl, methoximinomethyl, ethoximinomethyl, methoximinoethyl, ethoximinoethyl, cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl,

25 30 2,3-attached 1,3-propanediyl, methylenedioxy (-O-CH₂-O-) or 1,2-ethylenedioxy (O-CH₂-CH₂-O), where these radicals may be mono- or polysubstituted by identical or different substituents from the group consisting of fluorine, chlorine,

methyl, ethyl, n-propyl, i-propyl and trifluoromethyl.

5. A process for preparing pyrazolopyrimidines of the formula (I) as claimed in one or more of claims 1 to 4, characterized in that

a) pyrazolopyrimidines of the formula



5

in which

R¹, R², R³, R⁴, R⁷ and R⁸ are as defined above

are either

α) reacted with diisobutylaluminum hydride in the presence of aqueous ammonium chloride solution and in the presence of an organic diluent,

10

or reacted with sodium borohydride in the presence of a diluent,

or

β) reacted with Grignard compounds of the formula



15

in which

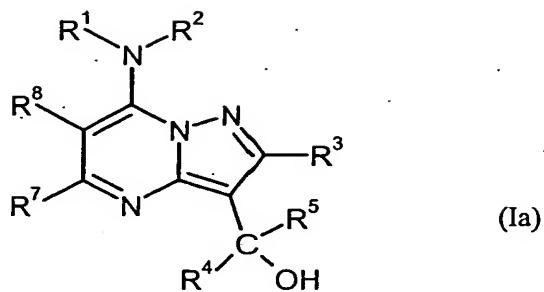
R⁹ represents alkyl, alkoxyalkyl, alkenyl, alkynyl or benzyl and

X represents chlorine, bromine or iodine,

in the presence of a catalyst and in the presence of a diluent,

20

and the pyrazolopyrimidines, obtained according to variant (α) or (β), of the formula



in which

R¹, R², R³, R⁴, R⁵, R⁷ and R⁸ are as defined above

are, if appropriate, reacted with compounds of the formula

5



in which

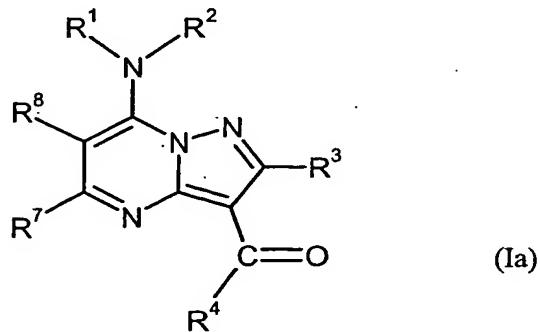
R¹⁰ represents alkyl, alkoxyalkyl, alkenyl, alkynyl or benzyl and

X¹ represents chlorine, bromine, iodine or the radical R¹⁰O-SO₂-O-,

if appropriate in the presence of a base and if appropriate in the presence of a
10 diluent,

or

b) pyrazolopyrimidines of the formula

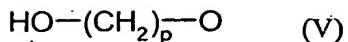


in which

15

R¹, R², R³, R⁴, R⁷ and R⁸ are as defined above,

are reacted with diols of the formula



in which

p represents integers from 1 to 5 and

1 to 3 hydrogen atoms may be replaced by methyl, ethyl, hydroxy, methoxy,
ethoxy, hydroxymethyl, methoxymethyl or ethoxymethyl,

5 in the presence of a catalyst and, if appropriate, in the presence of a diluent.

6. A composition for controlling unwanted microorganisms, characterized in that it comprises at least one pyrazolopyrimidine of the formula (I) according to one or more of claims 1 to 4, in addition to extenders and/or surfactants.
- 10 7. The composition as claimed in claim 6, comprising at least one further fungicidally or insecticidally active component.
8. The use of pyrazolopyrimidines of the formula (I) according to one or more of claims 1 to 4 for controlling unwanted microorganisms.
- 15 9. A method for controlling unwanted microorganisms, characterized in that pyrazolopyrimidines of the formula (I) according to one or more of claims 1 to 4 are applied to the unwanted microorganisms and/or their habitats.
10. A process for preparing compositions for controlling unwanted microorganisms, characterized in that pyrazolopyrimidines of the formula (I) according to one or more of claims 1 to 4 are mixed with extenders and/or surfactants.